

NPS Inventory and Monitoring Program



NATIONAL

Northeast Coastal and Barrier Network

Kilometers 300

Saugus Iron Works National Historic Site Boston Harbor Islands Cape Cod National Seashore

Acadia National Park

Sagamore Hill National Historic Site Fire Island National Seashore

Gateway National Recreation Area

National Capital Parks - East

George Washington Birthplace National Monument Assateague Island National Seashore

George Washington Memorial Parkway

Colonial National Historical Park

 Northeast Region Inventory and Monitoring Program (I&M)

Salt Marsh Condition
 Monitored at 10 coastal parks Maine to Virginia





I&M Monitoring Program Salt Marsh Indicators

Marsh Nekton:

 Methods adapted from, "Monitoring nekton in shallow estuarine habitats", developed by Raposa and Roman in 2001 Throw traps/ Ditch nets

Marsh Vegetation:

 Methods adapted from, "Monitoring salt marsh vegetation: a protocol for the long-term Coastal Ecosystem Monitoring Program at Cape Cod National Seashore", developed by Roman, James-Pirri, and Heltshe in 2001
 Permanent plots, Braun Blanquet Cover Scale

Sediment Elevation Tables (SET):

 Protocol being developed by NPS (Jim Lynch), USGS (Don Cahoon) and NOAA (Philippe Hensel). Will be NPS Inventory and Monitoring protocol

Marsh Birds:

 NCBN developing protocol to meet NPS I&M program standards--method adapted from, Saltmarsh Habitat & Avian Research Program (SHARP). Sampling design high resolution to meet local needs of parks Monitoring co-located on NPS marsh sites















Other NCBN Monitoring:

- Estuarine Water Quality
- Seagrass condition and distribution
- Coastal Shoreline Position
- Beach/dune topography
- Forest health
- Lidar





Vegetation and Nekton Monitoring

Nine--5-10 hectare marsh sites/park
50 sampling points/marsh site
Sampling occurs every two years



Measures:

- Vegetation % Cover & Composition, pore water salinity
- Nekton
 Composition,
 Abundance, & Size
 Structure





Marsh Bird Monitoring

- Based on the SHARP program
- Higher resolution sampling design, 50-60 points per/park
- Annual monitoring



Cape Cod NS Marsh Bird Monitoring Points



Sediment Elevation Monitoring

120 SETs across 12 parks
Data collection 2 x/yr
Co-located with other sampling

Metrics:

- •Relative Elevation
- Sediment Accretion
- Shallow Subsidence





Example Condition Table

Based on Vegetation Trend Data

% Cover-High salinity tolerant plants (Good= > 55% (5 pts.), Moderate= 40-55% (3 pts.), Poor= < 40% (1 pt.))

% Cover-Medium salinity tolerant plants (Good= < 4% (5 pts.), Moderate= 4-12% (3 pts.), Poor= > 12% (1 pt.))

% Cover-Low salinity tolerant plants (Good= < 2% (5 pts.), Moderate= 2-20% (3 pts.), Poor= > 20% (1 pt.))

% Cover Invasive Plants (Good= < 1% (5 pts.), Moderate= 1-20% (3 pts.), Poor= > 20% (1 pt.))

Trend in % cover Water and Bare Ground (based on 3 + sampling yrs) (Overall Condition [points (sum of 4 metrics above)]

Thresholds developed by technical science teams, literature review, and analysis

NCBN Salt Marsh Monitoring Database



- Vegetation & nekton data
- 7 NCBN parks, 1997-2009
- Current field sheets
- Data summary / export functions
- Linked to spatial data
- Users' Guide
- Data Dictionaries
- Metadata (FGDC, NBII)
- Archive-NPS IRMA

🖼 NCBN Salt Marsh Vegetation Monitoring				- - ×	
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Hurricane Sandy Mitigation Project Acquire high-resolution elevation data to improve storm surge forecasting and mitigation planning

Multiple Components-

•Equipment purchase and training of RTK "Swat Team" (12 NPS Staff trained in RTK, Total Station use and Data management)

• RTK data collection for prioritized park "Sentinel Sites" (Example: Sunken Forest, FIIS, 1st floor elevations of structures)

Installation of Geodetic monuments to support monitoring efforts

- •Data management in relation to storm response (LiDAR for parks)
- Science Communication
- •Assurance of Long-term Tide data (NOAA/USGS)

Marsh resiliency project–large data collection effort

Four Parks:

- •Cape Cod NS
- •Assateague Island NS
- •Fire NS
- •Gateway NRA



Salt Marsh Resiliency Component

•38 marsh sites-across four parks (Cape Cod, Fire Island, Gateway, Assateague)

•All I&M Long-term monitoring marshes and other select marshes

•RTK/Total Station Elevations collected on a 20-m grid for each marsh

•Vegetation-Braun Blanquet 1-m² plots on a 20-m grid for each marsh

•Water Level-10-20 Onset loggers/park deployed for 12 months or more

•Total Suspended Solids (TSS)

•Assuring permanent tide stations and calculated tidal datums for each park (NOAA and USGS partners)

•Modeling following data collection-Jim Morris

Cape Cod National Seashore

National Park Service

CCNS Wetland Vulnerability Project

2013-2015

Assess vulnerability of salt marshes and coastal wetlands to dieback, drowning, squeeze, habitat conversion

Include: elevation, vegetation types, accretion/erosion, barriers to migration, upland land use as predictive factors

Visualize- vulnerable wetlands & infrastructure

Products: planning tools (e.g. maps, visualizations, reports, predictions of land category change), workshop, interpretative exhibits



RTK based salt marsh elevation monitoring

- Unrestricted marshes
- 20 m grid
- Within salt marsh veg
- Mask- wide creeks, no SM veg





June-Sept 2013 ~8,500 RTK points 6 of 7 marshes





2014 Delineation of seaward extent of vegetation

Green-lowest limit of S. alterniflora, L

Red-lowest limit of S. patens, T

Blue- upper limit of *S. patens, U*

Factors that affect marsh accretion:

Above &

biomass



Inundation & salinity

Total Suspended Solids/turbidity





% cover, abundance, algae on marsh surface, soil compaction

Sediment deposition

S. alterniflora decomposition



Bulk density, sediment grain size, %OM





Yellow = elevations above current MHT

White = high marsh

Smith et al., in prep



+100 cm by 2100

HM, -100%, LM, -40%



Detailed view of tidal channel bank (point cloud)





Elev -1.344 m

1.744 m

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